Ocean Engineering Technical Data Sheet
Carmanah 701, 701-5, 702 and 702-5 LED Lanterns

The Carmanah 701, 701-5, 702 and 702-5 lanterns are nominal 3 to 4-nautical mile, self-powered, omni-directional LED lanterns for use on lighted aids to navigation. This document provides performance data (Section 1), selection criteria (Section 2), set-up, installation and maintenance instructions (Section 3), and ordering information (Section 4).

Overview

The Carmanah 701/702-series lanterns are manufactured by:

Carmanah Technologies Inc.,
Building 4, 203 Harbour Road
Victoria, British Columbia, Canada V9A 3S2
Phone: 1-877-722-8877
Website: http://www.carmanah.com/

The lanterns are self-contained; the solar panels, battery, flasher, daylight control and lantern assembly are housed as a single unit. They are available in four models: the 701, 702 and 702-5 (the 704-5 lantern is discussed in a separate Technical Data Sheet.). All four models produce the same intensity; the difference is the size of the solar panels and internal battery. The 701 has the least capable power system; the 702-5 has the most capable power system.

Every lantern has an inherent color (red, green, white or yellow), but the flash rhythms are programmable.

Carmanah 701-702 Series LED Lanterns

701 701-5 702 702-5

Carmanah will discontinue the 701 and 702 lanterns after 30 Sep 2008. Units and districts can continue to place orders for 701 and 702 lanterns until 30 Sep 2008. Orders for a 701 lantern will be filled by either a 701 or 701-5 lantern, and orders for a 702 lantern will be filled by either a 702 or 702-5 lantern. Orders for 701 and 702 lanterns will not be accepted after 30 Sep 2008.

CARMANAH 701, 701-5, 702 and 702-5 LED LANTERNS
SECTION 1
PERFORMANCE DATA

Intensity

The intensity of the red, green and white Carmanah 701/702-series lanterns have changed over previously published values. The old published values (lower intensity) are printed to the right of the new values. Red lanterns purchased after July 2007 produce the higher values. White and Green lanterns purchased after January 2007 produce the higher values. If you are uncertain when a lantern was purchased, send an email to Carmanah (boflynn@carmanah.com) with the serial number of the lantern and they can provide the date. To aid identification, all lanterns purchased after January 2008 will have a "**MOD2**" sticker affixed to its base and produce the higher listed intensities.

The following table shows effective intensities of Carmanah lanterns for the standard flash characteristics. For comparison, the table also shows the corresponding effective intensities of 155mm lanterns, with 0.55 amp lamps, in red, green, white and yellow.

EFFECTIVE INTENSITIES OF CARMANAH 701, 701-5, 702 and 702-5 LED Lanterns
(and 155mm lantern with 0.55 amp lamps – all values in candela – New /Old intensity values)

	Carmanah				155mm w/0.55a Lamps			
Characteristic	**red**	**green**	**white**	**yellow**	**red**	**green**	**white**	**yellow**
FL 2.5 (0.3)	20 /15	28 /15	21 /15	11	20	20	60	45
FL 4	22 /17	31 /17	21 /17	11	20	25	70	55
FL 6	25 /19	35 /19	26 /19	14	25	30	85	65
FL (2) 5	22 /17	31 /17	23 /17	12	20	25	70	55
FL (2+1) 6	20 /15	28 /15	21 /15	11	20	20	60	45
Mo(A)	--	--	19 /14	10	--	--	70	55
Q	17 /13	23 /13	18 /13	9	20	20	60	45

Vertical Divergence (degrees)

	Red	**Green**
50% beam width	±2.8	±3.5
15% beam width	±8.9	±9.5

CARMANAH 701, 701-5, 702 and 702-5 LED LANTERNS
SECTION 2
SELECTION

Overview

The 701/702-series Carmanah lanterns are authorized for use on the modified 5th class foam buoy. This buoy/lantern combination is a replacement for the old lighted discrepancy buoy. The lanterns can also be used on any standard Coast Guard lighted buoy or minor aid where the effective intensity satisfies the operational requirement. The lanterns shall not be installed on any buoy or structure without prior approval of the district aids to navigation office.

District Considerations - Intensity

The intensities of red and green Carmanah 701/702-series lanterns closely match the intensities of 155mm lanterns with 0.55 amp lamps. If a red or green aid has a 155mm lantern with 0.55 amp lamps, and if the existing effective intensity meets the operational need, then the aid is a potential candidate for a Carmanah 701/702-series lantern. The effective intensities of the white and yellow 701/702-series lanterns are considerably lower than the intensities of a white or yellow 155mm with 0.55 amp lamps. A white or yellow Carmanah 701/702 should not be installed until the District has carefully evaluated the aid and determined that a lower intensity and reduction in service to the mariner are acceptable.

To determine the intensity requirements for any aid, Districts use the standard procedures for selecting an AtoN light signal as prescribed in the AtoN Technical Manual (Chapter 6, Section 6.B, page 6-1) and the Visual Signal Design Manual (Chapter 3). These references describe how operational range, luminous range, light color, light characteristic, background lighting, and meteorological visibility are used to calculate intensity needs. Higher intensities can be obtained by using the Carmanah 704-5 LED Lantern (Technical Data Sheet 07-01); **http://www.uscg.mil/hq/cg4/cg432/docs/techsheets/2007-01.pdf**.

Selecting a Specific Carmanah Model

If, and only if the District has determined that a Carmanah will provide an intensity that meets the operational needs for a specific aid, **then** the next step is to choose a Carmanah model that has a power system matched to the aid location and flash characteristic. The table that begins on the following page should be used to select a Carmanah model. The table uses the same 92 solar radiation reference sites as the existing USCG solar sizing table. Note that the green lanterns are sized differently than the red, white or amber (yellow). Note also that some location/flash-characteristic combinations have an "N/A" (particularly in Districts 13 and 17). "N/A" means that no Carmanah model can be used because the power system cannot power the aid with the available solar radiation.

Note: The Carmanah 701 and 702 models are discontinued. Locations that require a 701 or 702 lantern can use a 701-5 and 702-5, respectively.

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	**FL 4 FL 6**	**FL 4 FL 6**	**FL 2.5 (0.3s)**	**FL 2.5 (0.3s)**	**FL(2+1)6**	**FL(2+1)6 FL (2) 5**	**Q**	**Q Mo (A)**
Portland, ME	701	701	701	702	701	702	702	702-5
Boston, MA	701	701	701	702	701	702	702	702-5
Providence, RI	701	701	701	702	701	702	702	702-5
Bridgeport, CT	701	701	701	702	701	702	702	702-5
New York, NY	701	701	701	702	701	702	702	702-5
Albany, NY	701	701	701	702	701	702	702	**N/A**
Burlington, VT	701	701	701	702	701	702	702	**N/A**
Newark, NJ	701	701	701	702	701	702	702	702-5
Atlantic City, NJ	701	701	701	701	701	702	702	702
Wilmington, DE	701	701	701	701	701	702	702	702
Philadelphia, PA	701	701	701	701	701	702	702	702
Baltimore, MD	701	701	701	701	701	702	702	702
Sterling, VA	701	701	701	701	701	702	702	702
Norfolk, VA	701	701	701	701	701	702	702	702
Cape Hatteras, NC	701	701	701	701	701	701	701	702
Wilmington, NC	701	701	701	701	701	701	701	702
Charleston, SC	701	701	701	701	701	701	701	702
Savannah, GA	701	701	701	701	701	701	701	702
Jacksonville, FL	701	701	701	701	701	701	701	702
Daytona Beach, FL	701	701	701	701	701	701	701	702
West Palm Beach, FL	701	701	701	701	701	701	701	702
Miami, FL	701	701	701	701	701	701	701	702
San Juan, PR	701	701	701	701	701	701	701	702
Key West, FL	701	701	701	701	701	701	701	702
Tampa, FL	701	701	701	701	701	701	701	702
Tallahassee, FL	701	701	701	701	701	701	701	702
Mobile, AL	701	701	701	701	701	701	701	702
New Orleans, LA	701	701	701	701	701	701	701	702
Port Arthur, TX	701	701	701	701	701	701	701	702
Houston, TX	701	701	701	701	701	701	701	702
Corpus Christi, TX	701	701	701	701	701	701	701	702
Brownsville, TX	701	701	701	701	701	701	701	702
Little Rock, AR	701	701	701	701	701	702	701	702
Fort Smith, AR	701	701	701	701	701	701	701	702

Notes:
1. Numbers in table refer to Carmanah Model number.
2. "N/A" means that no Carmanah can provide the desired characteristic.
3. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).
4. Contact Ocean Engineering for sizing information for seasonal aids.
5. Locations that require a 701 or 702 lantern can use a 701-5 and 702-5, respectively.

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	**FL 4 FL 6**	**FL 4 FL 6**	**FL 2.5 (0.3s)**	**FL 2.5 (0.3s)**	**FL(2+1)6**	**FL(2+1)6 FL (2) 5**	**Q**	**Q Mo (A)**
Oklahoma City, OK	701	701	701	701	701	701	701	702
Memphis, TN	701	701	701	701	701	702	702	702
Huntsville, AL	701	701	701	701	701	702	702	702
Chattanooga, TN	701	701	701	701	701	702	702	702
St Louis, MO	701	701	701	701	701	702	702	702
Kansas City, MO	701	701	701	701	701	702	702	702
Moline, IL	701	701	701	702	701	702	702	702-5
Minneapolis, MN	701	701	701	702	701	702	702	**N/A**
Evansville, IN	701	701	701	701	701	702	702	702
Indianapolis, IN	701	701	701	702	701	702	702	702-5
Louisville, KY	701	701	701	702	701	702	702	702-5
Cincinnati, OH	701	701	701	702	701	702	702	702-5
Pittsburgh, PA	701	702	701	702	701	702	702	**N/A**
Massena, NY	701	702	701	702	701	702	702	**N/A**
Rochester, NY	701	702	701	702	702	702	702	**N/A**
Buffalo, NY	701	702	701	702	702	702	702	**N/A**
Erie, PA	701	702	701	702	702	702	702	**N/A**
Cleveland, OH	701	702	701	702	702	702	702	**N/A**
Toledo, OH	701	702	701	702	701	702	702	**N/A**
Detroit, MI	701	702	701	702	702	702	702	**N/A**
Alpena, MI	701	702	701	702	702	702	702	**N/A**
Traverse City, MI	701	702	701	702	702	702	702	**N/A**
Muskegon, MI	701	702	701	702	702	702	702	**N/A**
Chicago, IL	701	702	701	702	701	702	702	**N/A**
Milwaukee, WI	701	702	701	702	701	702	702	**N/A**
Green Bay, WI	701	701	701	702	701	702	702	**N/A**
Sault Ste Marie, MI	701	702	701	702	702	702	702	**N/A**
Houghton, MI	701	702	702	702	702	702-5	702-5	**N/A**
Duluth, MN	701	702	701	702	701	702	702	**N/A**
Internat'l Falls, MN	701	702	701	702	702	702	702	**N/A**
Salt Lake City, UT	701	701	701	702	701	702	702	702-5
Reno, NV	701	701	701	701	701	702	701	702
Las Vegas, NV	701	701	701	701	701	701	701	702
San Diego, CA	701	701	701	701	701	701	701	702

Notes:
1. Numbers in table refer to Carmanah Model number.
2. "N/A" means that no Carmanah can provide the desired characteristic.
3. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).
4. Contact Ocean Engineering for sizing information for seasonal aids.
5. Locations that require a 701 or 702 lantern can use a 701-5 and 702-5, respectively.

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	**FL 4 FL 6**	**FL 4 FL 6**	**FL 2.5 (0.3s)**	**FL 2.5 (0.3s)**	**FL(2+1)6**	**FL(2+1)6 FL (2) 5**	**Q**	**Q Mo (A)**
Long Beach, CA	701	701	701	701	701	701	701	702
Los Angeles, CA	701	701	701	701	701	701	701	702
Santa Maria, CA	701	701	701	701	701	701	701	702
San Francisco, CA	701	701	701	701	701	702	702	702
Arcata, CA	701	701	701	702	701	702	702	702-5
North Bend, OR	701	702	701	702	701	702	702	**N/A**
Astoria, OR	701	702	702	702	702	**N/A**	702-5	**N/A**
Portland, OR	701	702	702	702	702	**N/A**	**N/A**	**N/A**
Pendleton, OR	701	702	701	702	702	702	702	**N/A**
Quillayute, WA	701	702	702	702	702	**N/A**	**N/A**	**N/A**
Seattle, WA	701	702	702	702	702	**N/A**	**N/A**	**N/A**
Annette, AK	702	**N/A**	702	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Yakutat, AK	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Anchorage, AK	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Kodiak, AK	702	**N/A**	702	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Cold Bay, AK	702	**N/A**	702	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
King Salmon, AK	702	**N/A**	702-5	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Bethel, AK	702-5	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Nome, AK	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Hilo, HI	701	701	701	701	701	701	701	702
Kahului, HI	701	701	701	701	701	701	701	702
Honolulu, HI	701	701	701	701	701	701	701	702
Lihue, HI	701	701	701	701	701	701	701	702
Guam	701	701	701	701	701	701	701	702

Notes:
1. Numbers in table refer to Carmanah Model number.
2. "N/A" means that no Carmanah can provide the desired characteristic.
3. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).
4. Contact Ocean Engineering for sizing information for seasonal aids.
5. Locations that require a 701 or 702 lantern can use a 701-5 and 702-5, respectively.

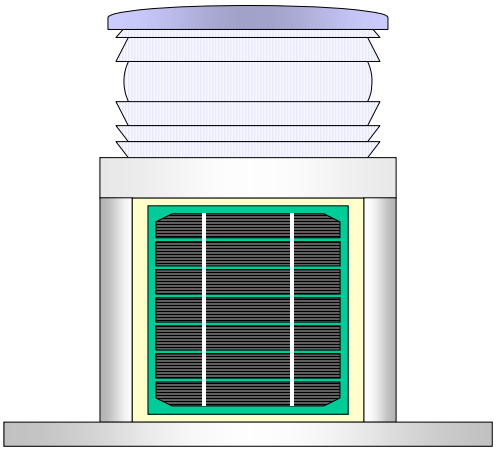
Nominal Range

The nominal range of the 701, 701-5, 702 and 702-5 lanterns is either 3 or 4 nautical miles. To find the correct nominal range, use the effective intensity (as listed in the "Intensity" section of this document) in conjunction with the following table.

Effective Intensity	Nominal Range
10-23 cd	3 nm
24-53cd	4 nm

The appropriate value for Nominal Range should be published in the Light List. **Caution:** as stated in the AtoN Technical Manual, "The nominal range of a light plays no part in the selection process." Never select a lantern for an aid based on the lantern's nominal range.

CARMANAH 701, 701-5, 702 AND 702-5 LED LANTERNS
SECTION 3
SET-UP, INSTALLATION AND MAINTENANCE



Receipt and Handling

The lanterns are charged prior to shipment. It will arrive fully charged and programmed OFF, (i.e., it will not flash in a darkened room) and ALC* feature disabled. If not needed right away it should be checked for damage, then stored in its box in a cool location. Take a few minutes to fill out and mail the warranty card shipped with the lantern – or fill out the warranty information on Carmanah's website: http://www.solarmarinelights.com/.

Important Handling Note: the top solar panel on a 701-5 and 702-5 lantern is not designed to support the full weight of the lantern. **Never use the top solar panel to lift the lantern.**

The batteries are very susceptible to self-discharge, especially if left unused in a very warm place for a long period of time. To avoid this unnecessary loss of charge and battery damage, store the lantern at 20°C (68°F) or cooler. If this is not possible, the lanterns (batteries) will have to be recharged at the following charge intervals to preserve the battery:

Storage Temperature [°F]	Recharge Interval for 701-702 Series Lanterns [months]
<70º	12
70º-90º	6
90º-105º	3
>105º	1

For example, if a 701/702-series lantern is stored at 100°F, it will have to be charged every 3 months in order to preserve the battery.

*The Automatic Light Control is not used on USCG aids to navigation.

The lantern should always be stored at 100% state of charge to avoid damaging the battery. Check the battery's state of charge using the procedure described below. If the battery state-of-charge is not 100%, then recharge prior to storage.

Determining Battery State of Charge (SOC)

The Battery State-of-Charge (SoC) is determined using the remote as follows:

- Transition the Lantern: per guidance in Programming Section
- Enter the Security Code : **POWER 7 5 3 CHAN^**
- Enter the Battery Status Code: **POWER 8 1 0 CHAN^**

The lantern will respond with 3 flashes (to indicate that it correctly received the instruction), then after a 2-second pause will emit a series of up to 10 flashes. Each flash indicates 10% usable charge (4 flashes indicate 40% state-of-charge; 10 flashes indicate full charge). After a brief pause the lantern will repeat the battery flashes for verification.

Recharging

The battery state-of-charge can be increased by leaving the lantern outside on a sunny day or by using an artificial light source.

Using Sunlight. The easiest way to recharge the lantern is to leave it outside on a sunny day. Use the following table to determine how many *sunny days* are required to return the lantern to 100% state-of-charge. Ensure that the lantern is turned off so that the light does not turn on at night (see Programming Section; the battery will recharge when the lantern is turned off).

Battery SoC	Sunny Days to Return Lantern to 100% SoC
90%	1
80%	2
70%	3
60%	4
50%	5
40%	6
30%	6
20%	7
10%	8

Using Artificial Light. Artificial light is capable of charging the lanterns if sunlight is unavailable or inconvenient. Use a high-intensity light such as a 90 – 150W halogen floodlight.

Set up the spot light so that it is *at least* 24" away from the solar panel to prevent the lantern from being damaged due to overheating. Desk lamps using 60W bulbs can be as close as 2" away from the solar panel. The plastic encasing the top solar panel is prone to heat damage and can crack or bubble if overheated. Arrange the charging light to cast as much illumination as possible on one of the *side* solar panels. Using additional charging lights on the other side solar panels will reduce the charging time.

Use the following table to determine how many days of artificial lighting are required to return the lantern to 100% state-of-charge (based on 24-hour/day charging).

Lantern Model	Light Source	Distance from Solar Panel	Hours to Charge Battery from 10% to 100%
701 701-5	500 W halogen spot	2 feet	300
	60 W tungsten in a reflector housing (desk lamp)	2 inches	
702 702-5	500 W halogen spot	2 feet	250
	60 W tungsten in a reflector housing (desk lamp)	2 inches	

Applying light to more than one solar panel at the same time can reduce the amount of time to charge 701/702 lanterns, e.g., four lights on four panels would divide charging time by four.

Warning: reduction of the distance will overheat the solar panel; increasing the distance greatly reduces the charging efficiency.

An alternative is to purchase an external charger from Carmanah and the access tool for the tamper resistant Allen screw (see the GSA contract information in Section 4); the 5/32" tamper resistant Allen wrench may be purchased from Carmanah or McMaster Carr Supply Company, 732-329-3200, part number 7390A27). The charger will recharge the battery in a fraction of the time, however specific procedures must be followed or damage to the battery and/or control unit will occur.

1. Place security bit in a hex-driver or drill and remove the top four screws from housing completely. Remove nylon washers from each of the holes in the flange. Discard both.
2. Gently pull up on one corner of the flange. Use caution as the head unit may stick due to the gasket being compressed onto the housing body.

3. Once the head has been separated, disconnect the 3-conductor (black and red) cable first, by depressing the catch on the clip and gently pulling apart. Be sure not to pull on the wires; grasp only the clip.
4. Disconnect the 2-conductor (orange and black) cable in the same manner as described above.
5. Remove the small desiccant pack from inside the light and discard.
6. Remove and retain the foam-packing block.
7. Take the battery pack out of the housing.
8. Attach the proper external charger pigtail to the connector feeding the battery.
9. Measure the voltage at the point where wires from the battery connector are soldered to the battery board. Ensure that the voltmeter probes do not touch each other when making a measurement.
10. Based on the voltage measurement, charge the battery in a well ventilated area for the following amount of time:

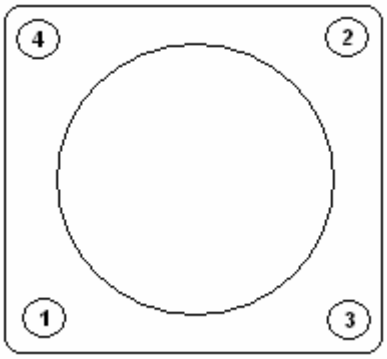
Voltage	701 & 701-5 Lantern (15 AH)	702 & 702-5 Lanterns (24 AH)
4.14 volts or higher	5 hours	7 hours
3.98 volts to 4.13 volts	15 hours	18 hours
3.86 volts or lower	20 hours	27 hours

Do not charge the battery longer than the time specified.
Overcharging can cause hydrogen gas to vent, which can reduce the battery life.

Make sure that the plugs on the charger do not touch each other if you have the old style of the charger with banana plugs.

11. Using a paper towel or cloth with a small amount of rubbing alcohol, wipe the top edge of the housing extrusion where it comes into contact with the head gasket. This will help ensure a proper seal.
12. Pull the gasket on the underside of the head out of its channel. Discard gasket.
13. Install the new gasket by pressing it into place. Be sure it is evenly seated in the channel. DO NOT USE TOOLS. USE YOUR FINGERS ONLY.
14. Reinstall the foam-packing block and a new desiccant bag (if available).
15. Place the optic head next to the base and connect the orange and black cable first. The light should begin flashing. The light will retain the last flash pattern programmed.
16. Connect the black and red cable.
17. Place the head into position on top of the housing. ENSURE THAT THE CABLING DOES NOT PROTRUDE OUTSIDE THE HOUSING! IF IT DOES IT WILL BE PINCHED AND CUT BY THE FLANGE WHEN IT IS BEING TIGHTENED. Tuck it in with your finger or a blunt tool.
18. Place a new nylon washer into each hole recess.

19. Using an anti-seize paste (Permatex or equivalent), lightly coat the threads of the new screws and insert them into the mounting holes as far as you can, using your fingers. This will help avoid the chance of cross threading.
20. Using the security bit, tighten the head down in the following order:



21. Tighten the screws firmly by hand to slightly compress the gasket. Over tightening may damage the threads in the aluminum base.

Programming

The color of the lantern cannot be identified by the appearance of the lens or LEDs when they are off. The color of the lantern is indicated by the color of the ring around the lens.

All programming is accomplished with a TV remote control set to communicate with the lantern. The remote can be purchased from Carmanah or a RCA TV Universal Remote can be purchased locally.

Carmanah Remote. If the lantern does not respond to the remote, or if the remote's batteries have been replaced, then the remote must be **initialized** as follows:

Press and hold	**CODE SEARCH**	until red light on remote turns on
Press	**TV**	red light on remote will blink once
Enter	**0 0 6**	red light will blink once after each entry

RCA Television Universal Remote. There are about 30 different RCA TV Universal Remote Controls. The remote must be **initialized** so that the remote can communicate with the lantern. Different models have different initialization procedures. If the remote purchased uses a 3-digit code use code 0 0 6. If the remote uses a 4-digit code use code 1 0 0 6. **Consult the instructions that come with the remote**. Follow the "Direct Entry Method" for programming a TV as shown in the instructions. Initialization will likely take one of the following two forms:

Press and hold	**CODE SEARCH**	until red light on remote turns on
Press	**TV**	red light on remote will blink, then stay on

Enter	**0 0 6**	red light will turn off after 3-digit code successfully entered

or

Press and hold	**TV**	keep holding TV button!
Enter	**1 0 0 6**	**while still holding TV button**
Release TV button		

Programming Overview.

Programming the lantern always requires a 3-step process:

Step 1. "Transitioning" the lantern. See the "Transitioning the Lantern" section for details.

Step 2. Enter the security code as follows:

Press	**POWER**	lantern will flash once
Enter	**7 5 3**	lantern will flash once after each entry
Press	**CHAN^**	lantern will flash once – then flash 3 times if the security code is successfully entered.

Step 3. Enter the desired programming instructions:

Press	**POWER**	lantern will flash once
Enter	**# # #**	where # # # is the appropriate instruction code (see instruction codes below; lantern will flash once after each entry
Press	**CHAN^**	lantern will flash once – then flash 3 times if the instruction is successfully entered.

Notes:
1. "**POWER**" means pressing the remote's ON/OFF button.
2. More than 1 programming instruction can be entered as long as not more than 1 minute passes between successive entries.
3. After 1 minute of no entries the lantern exits the programming mode. If more instructions are needed and the lantern has exited the programming mode, then the user must start again at Step 1 (transition the lantern).

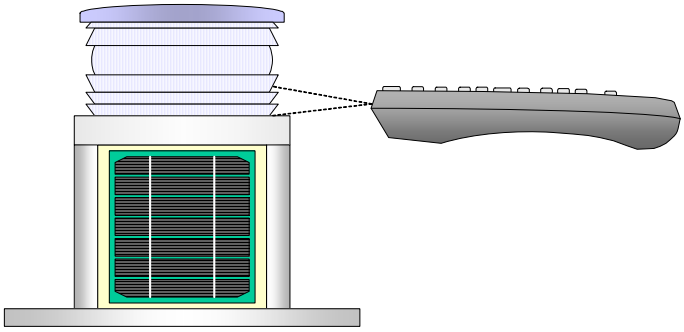
Transitioning the Lantern.

Before the lantern will accept any instructions from the remote the lantern must be "transitioned." *Transitioned* means either moving the lantern from a dark environment to a bright environment, or visa versa.

If the lantern will be programmed in a bright (daylight) environment:

- Cover the lantern with a coat, blanket, shroud, or any other material that blocks light. Keep it covered for 20 seconds.
- Remove the cover.
- Point the remote at the lens and press the ON/OFF(POWER) button repeatedly. If the lantern responds with a flash, it has transitioned and it is ready for programming.

Note: Proceed to Step 2 (entering the Security Code) within 1 minute of transitioning.



If the lantern will be programmed in a dark (nighttime) environment:

- Expose the lantern to a **high** level of external light. A typical incandescent or fluorescent light may not be bright enough. It may require a 90W or greater halogen floodlight or sunlight. Keep the lantern in the high-light condition for 20 seconds.
- Move the lantern to a dark condition (by either turning off the external light, covering the lantern, or moving the lantern indoors to a dark room).
- Point the remote at the lens and press the ON/OFF(POWER) button repeatedly. If the lantern responds with a flash, it has transitioned and it is ready for programming.

Note: Proceed to Step 2 (entering the Security Code) within 1 minute of transitioning.

Putting It All Together.

Here's the short version of what must be done to program the lantern:

Step 1. Transition the lantern: as described above.

Step 2. Enter Security Code: **POWER 7 5 3 CHAN^**

Step 3. Enter programming instructions as appropriate:

POWER 0 4 9 CHAN^	to select FL 2.5 (.3)
POWER 1 7 4 CHAN^	to select FL 4 (.4)
POWER 0 7 3 CHAN^	to select FL 6 (.6)
POWER 1 2 9 CHAN^	to select Quick Flash
POWER 0 2 2 CHAN^	to select FL (2+1) 6
POWER 1 7 5 CHAN^	to select FL (2) 5
POWER 1 7 6 CHAN^	to select Mo(A)
POWER 8 0 0 CHAN^	to turn ALC off. **Required for all aids.**

POWER 0 0 0 CHAN^ to TURN OFF the lantern (for storage)

Final Programming Hints and Notes.

1. The 701/702-series lanterns have an *optional* feature called "Automatic Light Control" (ALC). This feature automatically reduces light intensity (several times) as battery voltage drops. The ALC feature should **never** be used on USCG aids. Turn ALC "off" using code 800 as described in the "Putting It All Together" section.

2. Transitioning the lantern is typically the trickiest part. If the lantern is not responding to the remote, it probably hasn't transitioned. Repeat the transitioning process.

3. The lantern should flash one time in response to a button on the remote being pushed. If the lantern does not respond, or if it responds with 2 flashes, then the signal from the remote was not properly received.

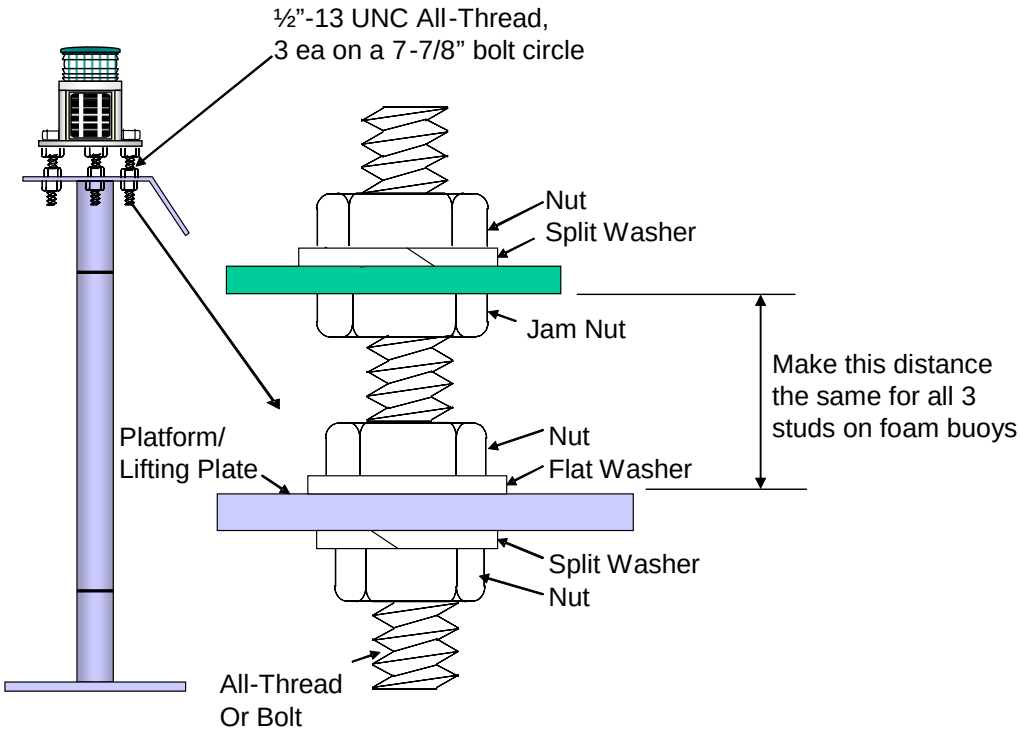
4. After completing a program instruction (and after the one quick flash in response to the CHAN^ button), the lantern should flash 3 times to indicate that it has received and processed the instruction.

5. The lantern will exit the programming mode if it goes 1 minute without receiving any input. Don't delay. Have a plan. Start from scratch (transition the lantern) if more than a minute passes and the lantern is no longer responding.

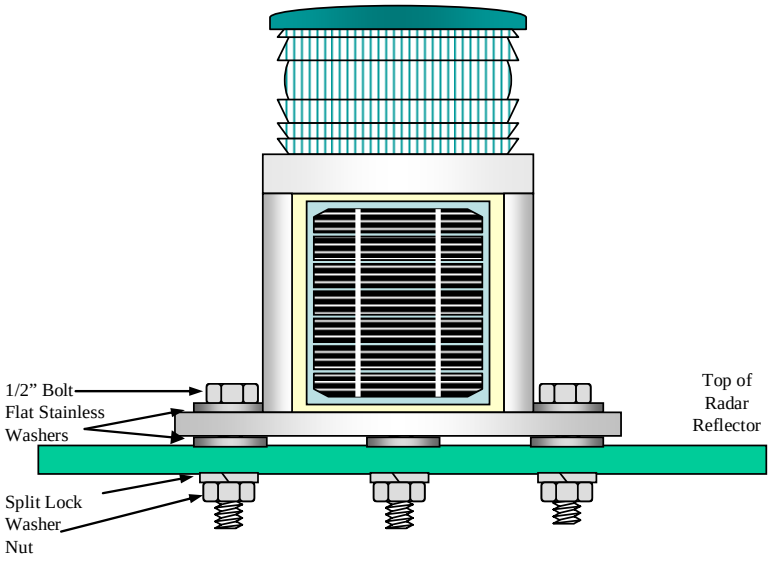
Installation

Mount the lantern **on a fixed aid or foam buoy** as shown on the next page. The lantern should ALWAYS be mounted with 3 bolts (or lengths of all-thread), never 4. The bolts will shadow the solar panels if they extend too far above the lantern's base. Therefore, after securing the bolts (or all-thread) to the structure's mounting plate as shown in the figure, install three jam nuts on the bolts so that about 1" of thread is exposed. Place the lantern on top of the jam nuts, then drop on the split washers and position the uppermost nuts at the very upper end of the thread. Do not tighten these uppermost nuts – they are positioned at this time to ensure that the lantern doesn't fall off. Level the lantern on structures by adjusting the jam nuts (use a torpedo level on the base plate of the lantern - use the "T" method described in the Short Range Aids to Navigation Servicing Guide COMDTINST M16500.19A). On foam buoys the lantern is not "leveled", but the distance from the lifting eye plate to the jam nuts on all three bolts should be the same. When the lantern is level, tighten the upper-most nuts (40 – 44 ft-lbs).

Installation – Structure/Foam Buoy



Mount the lantern **on a steel/composite (plastic) buoy** as shown below. The lantern should ALWAYS be mounted with 3 bolts, never 4. Note that stainless steel washers **MUST BE** installed between the lantern base and buoy's mounting plate. **The lantern vents through a hole in the bottom of the lantern's base, so the lantern CAN NOT be mounted flush with the buoy's mounting plate.** Stainless steel washers should also be installed between the heads of the mounting bolts and the top of the lantern's base as shown below. The mounting bolts should be torqued to 40 – 44 ft-lbs.



Servicing

Servicing should be performed in accordance with the standard cycle established for the aid.

Ensure that the lens and solar panels are clean. Wipe with a cloth dampened with mild soap and water, if necessary.

Cover the lantern with a shroud, jacket, box, blanket, etc., to simulate darkness. The lantern should flash on rhythm after a few seconds. It should stop flashing after the cover is removed in the daytime. While covered, observe the LEDs through the lens. Dark sectors indicate that an LED cluster is not operating, necessitating replacement of the optic head.

Uncover the lantern. It should stop flashing.

Troubleshooting

Symptom: Lantern will not respond to the remote.

- The most likely problem is that the lantern has not transitioned. Repeat the transitioning process as described in the "Transitioning the Lantern" section.
- It's possible that the batteries in the remote are dead, the remote is not functioning, or that the remote is not properly initialized. Change the batteries in the remote and initialize the remote as described in the "Remote Control" section. If that doesn't work, try another remote.

Symptom: Lantern does not flash the programmed flash characteristic. Instead if flashes one quick flash once a minute.

- The battery state-of-charge is unacceptably low. If the battery becomes further discharged, the main LED array will no longer flash once per minute.
- If the lantern was sized properly and if it was programmed properly (correct flash characteristic and light intensity setting) then it should maintain a high state-of-charge. Confirm proper solar sizing using the table in this data sheet. Confirm proper programming.
- Look for other reasons the system did not maintain a satisfactory state-of-charge. Are the vertical panels covered with guano? Is the lantern shaded? Is the DLC properly turning off the light during daylight?
- How old is the battery? Is it past the recharge interval shown in the "Service Life" section? If the battery is past its recharge interval, purchase a new battery from Carmanah.
- If all items above check out, contact Ocean Engineering.

Symptom: Lantern reported discrepant.

- Determine the battery's state-of-charge as described in the "Determining Battery State-of-Charge" section. If state-of-charge is less than 60% then proceed through the steps in the troubleshooting section immediately above.
- If battery state-of-charge is 60% or greater then reprogram the lantern. Ensure that lantern responds as expected to programming instructions.
- 701/702-series lanterns purchased prior to Oct 2007 have 8 LEDs that are evenly spaced around the optic head. Lanterns purchased after that date use 24 LEDs. When the light flashes, confirm that the light output appears to be uniformly distributed through 360 degrees (check the LEDs by looking slightly down at the lantern from above the lantern's focal plane; DO NOT look into the lantern with your eye in the focal plane).
- If the lantern does not perform as it should, and the problem is not attributable to physical damage, Carmanah will replace the lantern – free of charge – within the first year of purchase. If the lantern is between 1 and 3 years old it is covered by Carmanah's 3-year pro-rated warranty. A warranty card is supplied with each unit. The warranty can also found be online at: http://www.carmanah.com/content/products/warranty/. Contact Carmanah Customer Service (info below) before returning a lantern or seeking a warranty claim.

Carmanah Customer Service

Mail: Carmanah Technologies Corp.
Building 4, 203 Harbour Rd.
Victoria, BC Canada V9A 3S2
Phone: 1-250-380-0052
1-877-722-8877 (Toll Free)
Contact: Brian O'Flynn
Fax: 1-250-380-0062
Email: customerservice@carmanah.com or boflynn@carmanah.com
Website: www.carmanah.com

Before contacting Carmanah's customer service, please have the serial number of the lantern available, a brief description of the problem, as well as all details of installation and recharging efforts.

Service Life

Batteries. The expected battery life is highly dependent on temperature. The higher the temperature the shorter the expected battery life. Battery recharge intervals range from 4 years in hot climates to 10 years in cold climates. Field units should recharge (replace) batteries at intervals as shown in the Table on the next page.

Battery replacement by Coast Guard personnel is the preferred procedure. Detailed instructions are included with each battery. Lanterns returned to Carmanah for battery replacement will also receive a lantern inspection and software updates as needed. Contact Carmanah for pricing.

District	Recharge Interval (years)
D1	8
D5 (VA north)	7
D5 (NC)	6
D7 (SC & GA)	5
D7 (FL & PR)	4
D8 (FL, MS, AL & LA)	5
D8 (TX)	4
D8 (rivers - Cairo south)	6
D8 (rivers - Cairo north)	7
D9	8
D11 (southern CA)	6
D11 (northern CA)	7
D13	9
D14	4
D17	10

Lantern. The lantern can be kept in service as long as it provides an acceptable signal.

CARMANAH 701, 701-5, 702 and 702-5 LED LANTERNS
SECTION 4
ORDERING INSTRUCTIONS

The Carmanah 701/702-series LED lanterns are manufactured and sold by:

Carmanah Technologies Inc.
Building 4, 203 Harbour Road
Victoria, British Columbia, Canada V9A 3S2

Phone: (877) 722-8877
Website: http://www.carmanah.com.

Lanterns may be purchased on-line or by phone using a Government credit card. The buyer specifies the Model Number (701, 701-5, 702, 702-5) and specifies the color (red, green, white or yellow). An optional bird deterrent may be purchased. Note that the 701 and 702 will not be available after September 30, 2008.

Coast Guard units should buy Carmanah products using Carmanah's General Services Administration (GSA) contract (attached). Information can be found on GSA's Website:

https://www.gsaadvantage.gov ← go to this site and search on keyword "Carmanah."

Be sure that the contract number (GS-07F-0513M) is listed next to the item and that the manufacturer is "Carmanah" There are other manufacturers that offer the same lanterns at a higher price. Also click on the subcategory "Marine" to see the proper series lanterns.

Standard Form 1449, Contract for Commercial Items Page lB
Carmanah Technologies Inc.
Contract Number GS-07F-0513M

GENERAL SERVICES ADMINISTRATION
FEDERAL SUPPLY SERVICE
AUTHORIZED FEDERAL SUPPLY SCHEDULE CATALOG/PRICE LIST

On-line access to contract ordering information, terms and conditions, up-to-date pricing, and the option to create an electronic delivery order is available through GSA *Advantage!*, a menu-driven database system. The INTERNET address for GSA *Advantage!* is http://www.gsa.gov.)

SCHEDULE TITLE: FSC 62, Attachment #11 – Solar Energy Systems, Energy Efficient and Specialty Lighting Products

FSC CLASS (ES): 6117

CONTRACT NUMBER: GS-07F-0513M

CONTRACT PERIOD: 9/4/02 through 9/3/07 (extended through 2012)

CONTRACTOR'S NAME, ADDRESS, TELEPHONE AND FAX NUMBER; E-MAIL AND/OR WEB SITE ADDRESS:

Carmanah Technologies Inc.
Building 4
203 Harbour Road
Victoria, British Columbia, CN V9A 3S2

Telephone: 250-380-0052
Fax: 250-380-0062

CONTRACTOR'S ADMINISTRATION SOURCE: Irene Schamhart and Darren Webb

BUSINESS SIZE/TYPE: Small Foreign Manufacturer

INFORMATION FOR ORDERING ACTIVITIES:

1a. TABLE OF AWARDED SPECIAL ITEM NUMBERS (SIN's)

SIN	DESCRIPTION
206-3	Solar Energy Systems

lb. LOWEST PRICED MODEL NUMBER AND PRICE FOR EACH SIN:
(Government net price based on a unit of one)

SIN	MODEL	PRICE
206-3	*	*

Standard Form 1449, Contract for Commercial Items (Cont'd) Page 1C
Carmanah Technologies Inc.
Contract Number GS-07F-0513M

2. MAXIMUM ORDER PER SIN: $75,000*

*If the "best value" selection places your order over this Maximum Order, you have an opportunity to obtain a better schedule contract price. Before placing your order, contact the aforementioned contractor for a better price. The contractor may (1) offer a new price for this requirement (2) offer the lowest price available under this contract or (3) decline the order. A delivery order that exceeds the maximum order may be placed under the Schedule contract in accordance with FAR 8.404.

3. MINIMUM ORDER: $100 unless the contractor agrees to accept a smaller order amount.

4. GEOGRAPHIC COVERAGE: The 50 United States, Puerto Rico, and Washington, D.C

5. POINT(S) OF PRODUCTION: Same as contractor's address

6. BASIC DISCOUNT: 19-38% off Carmanah Price List dated July 2006

7. QUANTITY DISCOUNT (5): None

8. PROMPT PAYMENT TERMS: Net 30 Days

9. TYPE OF GOVERNMENT PURCHASE CARD ACCEPTED: All major credit cards

10. FOREIGN ITEMS: None

1la. TIME OF DELIVERY: 14 Days ARO

1lb. EXPEDITED DELIVERY: Please call for telephone confirmation of availability.

11c. OVERNIGHT AND 2-DAY DELIVERY: Same as 1lb.

11d. URGENT DELIVERY: When the delivery period above does not meet the customer's bona fide urgent delivery requirements, customers are encouraged, if time permits, to contact the contractor for the purpose of requesting accelerated delivery. The contractor shall reply within 3 workdays after receipt. (Telephonic replies shall be confirmed by the contractor in writing.) If the contractor offers an accelerated delivery time acceptable to the customer, any orders placed pursuant to the agreed upon accelerated delivery time frame shall be delivered within this shorter delivery time and in accordance with all other terms and conditions of the contract.

12. FOB POINT: Origin

13. ORDERING ADDRESS: Same as Contractor's Address

14. PAYMENT ADDRESS: Same as Contractor's Address

Standard Form 1449, Contract for Commercial Items (Cont'd) Page 1D
Carmanah Technologies Inc.
Contract Number GS-07F-0513M

15. WARRANTY: Standard Commercial 3 year limited Product Warranty

16. EXPORT PACKING CHARGES: Not applicable

17. TERMS AND CONDITIONS OF GOVERNMENT PURCHASE CARD ACCEPTANCE: Contractor will accept Government Purchase Card for orders of $2,500 or less. Contact contractor for acceptance of larger orders.

18. TERMS AND CONDITIONS OF RENTAL, MAINTENANCE, AND REPAIR (IF APPLICABLE):

19. TERMS AND CONDITIONS OF INSTALLATION (IF APPLICABLE):

20a. TERMS AND CONDITIONS OF REPAIR PARTS INDICATING DATE OF PARTS PRICE LISTS AND ANY DISCOUNTS FROM LIST PRICES (IF AVAILABLE):

20b. TERMS AND CONDITIONS FOR ANY OTHER SERVICES (IF APPLICABLE):

21. LIST OF SERVICE AND DISTRIBUTION POINTS (IF APPLICABLE):

22. LIST OF PARTICIPATING DEALERS (IF APPLICABLE):

23. PREVENTIVE MAINTENANCE (IF APPLICABLE):

24. ENVIRONMENTAL ATTRIBUTES (e.g. RECYCLED CONTENT, ENERGY EFFICIENCY, AND/OR REDUCED POLLUTANTS): *

1 Oct 2007

Carmanah

Price List

Products		List Price (US Dollars)	GSA Contract Price
Model M701*	Self Contained LED Lantern – 3 mile	$1039.00	$749.25
Model M701-5	Self Contained LED Lantern – 3 mile	$1169.00	$843.08
Model M702	Self Contained LED Lantern – 3 mile	$1247.00	$899.25
Model M702-5	Self Contained LED Lantern – 3 mile	$1299.00	$936.75
Model M704-5	Self Contained LED Lantern – 4 mile		$1249.00
30404	Bird Spike for 701 & 702 lanterns	$23.00	$16.00 extra
35896	Clamp-on Bird Spike/older 701, 702, all 704-5	$21.95	$15.00
30797	External Battery Charger	$207.00	$89.00
FG10676	IR Remote Control	$37.00	$29.00
Kit-015	Head/Battery Replacement Gasket Kit	$15.00	$9.95
30567	Tamper Resistant Tool	$7.00	$6.00
Kit-007	Battery Replacement (702)	$207.00	$119.40
Kit-006	Battery Replacement (701)	$155.00	$89.00
------	701 Head Replacement	$462.00	$332.81

*The prefix “M” denotes Marine Lantern.

All prices are in U.S. dollars.
Payment terms: Prepayment by Visa, MasterCard, bank draft or wire transfer.
Prices do not include shipping, freight insurance or applicable taxes and duties.

For US Coast Guard units: To obtain the GSA price, contact Brian O’Flynn at 877-722-8877, boflynn@carmanah.com or order online using GSA Advantage.

NOTE: Carmanah will discontinue the 701 and 702 lanterns after 30 Sep 2008. Units and districts can continue to place orders for 701 and 702 lanterns until 30 Sep 2008. Orders for a 701 lantern will be filled by either a 701 or 701-5 lantern, and orders for a 702 lantern will be filled by either a 702 or 702-5 lantern. If Carmanah elects to fill a 701 order with a 701-5 lantern then they will charge the 701 price; if Carmanah elects to fill a 702 order with a 702-5 lantern then they will charge the 702 price. **Orders for 701 and 702 lanterns will not be accepted after 30 Sep 2008.**

Carmanah Technologies Inc. Building 4, 203 Harbour Rd., Victoria, British Columbia. Canada V9A 352
Toll-free: (877) 722-8877; General: (250) 380-0052; Fax: (250) 380-0062
E-mail: info@carmanah.com Web: www.carmanah.com

Carmanah products are covered by a three-year warranty.
Please visit http://www.carmanah.com/warranty.html for complete details.